

A-820 show promise but are not currently registered for nursery use.

LITERATURE CITED

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MODERATOR FRETZ: We are still running behind time and all questions will have to be deferred until this evening's program. Our next speaker is William Bennett who will speak on herbicides and combinations in field liners.

HERBICIDES AND COMBINATIONS IN FIELD LINERS

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Chemical weed control programs for nursery crops have been adopted at an increasing rate over the past several years. Effective herbicides have been developed and tested and nursery operators have shown cost reductions for weed control when compared to mechanical methods. Injury to nursery crops has been negligible when recommended herbicides are used at the correct time and at suggested rates of application.

Field trials of many herbicides and combinations of two or more chemicals have been conducted in Massachusetts by the Cooperative Extension Service for several years. Growers and chemical companies have been very cooperative in making these possible. In designing various field trials several considerations were basic to the decision making process. These are as follows:

1. The first flush of weed growth following transplanting is probably the most important to control effectively.
2. Granular formulations are much more practical for the smaller grower or the treatment of smaller blocks of similar plant material.

3. Simazine is basic to any nursery herbicide program but it has limitations, e.g. weak on annual grass control.
4. Combinations of simazine at relatively low rates (1 lb. a.i./A) and one of several herbicides effective against annual grasses generally result in effective broad spectrum weed control and minimal plant injury.

SENSITIVITY OF NEWLY PLANTED NURSERY CROPS

Trials during 1965 and 1966 were designed to determine the toxicity of several herbicides and herbicide combinations to newly planted nursery species and were established in the three Extension regions of Massachusetts. Rooted cuttings were planted in May of each year, herbicides were applied, and a 1-inch irrigation followed. Trial plots ranged in size from 72 to 120 square feet. Plots were replicated two or three times at the various locations. Plant species were chosen which were known to be sensitive to the usual rates of simazine. These included *Euonymus alatus* 'Compactus,' *Forsythia x intermedia* and *Ligustrum ibolium* (privet). Soil types included sandy loam (Barnstable), medium loam (Hathorne), and silt loam (Amherst). Weed species existing in the trial areas included smartweed [*Polygonum scabrum*, Moench], galinsoga [*Galinsoga ciliata* (Raf.) Blake], purslane [*Portulaca oleraceae*], lambsquarters [*Chenopodium album* L.], foxtail [*Setaria viridis* (L.) Beauv.], barnyard grass [*Echinochloa crus-galli* (L.) Beauv.], and crabgrass [*Digitaria sanguinalis* (L.) Scop].

Simazine, and combinations including simazine, resulted in severe injury in all plots in 1965 where wettable powder formulations were used. Plant injury in all cases appeared as yellowing and chlorosis of leaf margins usually recognized as simazine injury.

In 1966, when granular formulations were used, injury was also greatest in all simazine plots, although generally not as severe as with wettable powders. The 1965 results prompted the inclusion of trifluralin and a dacthal + diphenamid combination in 1966 trials.

Under the severe conditions of these trials the injury to nursery plants was much greater than could be tolerated in commercial practice. Results indicated however that effective weed control could be achieved with combinations of herbicides. Table 1 shows results of these trials. Trifluralin at 1 or 2 lbs. a.i./A in either liquid or granular form did not provide satisfactory weed control. Plant injury with these treatments was negligible. The combination of dacthal + diphenamid performed similarly to the trifluralin. Simazine at 2 lbs. a.i./A resulted in only slightly im-

proved weed control while at the same time causing severe plant damage. The combinations of simazine 1 lb. a.i./A + diphenamid 4 lbs. a.i./A in both wettable powder and granular formulations provided increased weed control and a reduction in plant injury. This combination resulted in less plant injury in the granular formulation.

GRANULAR COMBINATIONS

For several years following these trials our intention has been to investigate the efficacy of newer grass herbicides as they became available and methods of application. These have been used in combination with simazine in all cases. At various times one or more major herbicide producer showed an interest in combinations of materials formulated on one granule. These were incorporated into the field trials during the years 1968-1970. Some of the combinations investigated during the time included:

simazine 1 lb. a.i./A	+	DCPA 10 lbs. a.i./A
“	+	diphenamid 4 lbs. a.i./A
”	+	trifluralin 2 lbs. a.i./A
”	+	alachlor 4 lbs. a.i./A

Table 1. Average weed control and plant injury ratings to newly set nursery crops

Treatments	Average Weed Control Ratings ¹			Average Plant Injury Ratings ²		
	(Amherst)	(Barnstable)	(Hathorne)	(Privet)	(Forsythia)	(euonymous)
1 Treflan 1 lb Liquid	5.7	5.7	5.7	9.0	9.0	9.0
2 Treflan 2 lbs Liquid	6.7	5.7	6.7	9.0	9.0	8.3
3 Treflan 1 lb Gr	3.3	2.3	3.7	9.0	9.0	8.5
4 Treflan 2 lbs Gr	5.3	4.0	5.7	9.0	9.0	8.1
5 Dacthal 5 lbs Gr +Diphenamid 2 lbs. Gr	5.7	5.0	5.7	9.0	8.9	8.4
6 Simazine 2 lbs Gr	6.0	4.3	6.0	4.4	4.5	4.8
7 Simazine 1 lb Gr +Diphenamid 4 lbs Gr	6.3	6.0	6.7	5.7	6.5	5.9
8 Simazine 1 lb Gr.	7.3	3.7	7.7	6.1	6.5	6.3
9 Simazine 1 lb W P +Diphenamid 4 lbs W P	8.7	6.0	8.7	4.5	5.2	4.4
10 Check	1.0	1.0	1.0	9.0	9.0	9.0

¹ Weed Control Rating — 9.0 = perfect control, 7.0 = acceptable commercial control, 1.0 = no control

² Injury Rating — 9.0 = no injury; 1.0 = severe injury

Results with these combinations on a wide range of nursery species have been generally satisfactory in controlling annual weeds. They were applied following planting in May or June or immediately following a June clean-up of established nursery blocks. It was hoped that some of these combinations would be made available to the nursery trade, but this became less likely as

time progressed. It appeared that unless both chemicals were products of the same company it was not realistic to expect to see them on the market as one material. Many considerations such as registration procedures, liability determinations and others must be weighed in these policy determinations. Recent rulings by the Environmental Protection Agency now allow the mixing of registered chemicals to be applied as a tank-mix. This may encourage manufacturers to investigate the market potential of herbicide combinations.

FIELD MIXTURES OF GRANULAR HERBICIDES

During 1972 and 1973 field trials were established to determine the feasibility of blending or mixing commercially available granular herbicides prior to application to nursery stock. The mixing of two or more granules of dissimilar size and density has always been thought to result in uneven distribution. This could result in unsatisfactory weed control and/or plant injury.

Simazine (4% Gr) at 1 lb. a.i./A was field mixed with several grass killers in duplicated plots in three nurseries in June, 1972. Grass killers included the following: trifluralin (5% Gr) at 2 lbs. a.i./A; bensulide (3.6% Gr) at 8 lbs. a.i./A; alachlor (10% Gr) at 4 lbs. a.i./A; Amchem A 820 (2.3% Gr) at 4 lbs. a.i./A; Devrinol* (10% Gr) at 4 lbs. a.i./A; Geigy CG 10832 (2% Gr) at 2 lbs. a.i./A; and diphenamid (5% Gr) at 6 lbs. a.i./A. All materials were surface applied to weed-free soil with a hand applicator.

Predominant weed species included crabgrass, foxtail, pigweed, lambsquarters, and knawel [*Scleranthus annuus* L.]

All combinations except simazine 1 lb. a.i./A + betasan 8 lbs. a.i./A and simazine 1 lb. a.i./A + diphenamid 6 lbs. a.i./A resulted in satisfactory weed control. Results are shown in Table 2.

Additional trials of the most promising of these combinations were conducted during the fall of 1972 and spring 1973. Fall treatments were applied in November and evaluations were made in May and June, 1973. All combinations resulted in satisfactory weed control under the conditions of these trials.

The 1973 trials were initiated in June and July at two nurseries. Plot size was increased from 200 to 250 sq ft in 1972 to 2200 to 2500 sq ft in 1973. This was an attempt to determine if distribution uniformity was satisfactory on larger areas. Evaluations in September and October showed satisfactory control of annual weeds. These trials included a rather large number of plant genera including *Taxus*, *Acer*, *Malus*, *Quercus*, *Sorbus*, *Gleditsia* and *Crataegus*.

* Trade Name

Table 2. Average weed control ratings with granular mixtures

Granular Mixture	Rate lbs a.i /A	Weed Control*	
		Broadleaf	Grass
Simazine 4G + Trifluralin 5G	1 + 2	7.6	7.3
Simazine 4G + Bensulide 3.6G	1 + 8	6.6	5.6
Simazine 4G + Alachlor 10G	1 + 4	8.0	7.6
Simazine 4G + Amchem (A-820) 2.3G	1 + 4	8.0	7.6
Simazine 4G + Devrinol 10G	1 + 4	8.0	8.3
Simazine 4G + Geigy (CG-10832) 2G	1 + 2	8.3	7.0
Simazine 4G + Diphenamid 5G	1 + 6	7.0	6.3
Check		4.6	1.6

* Rating System: 1.0 = no control 9.0 = complete control

MODERATOR FRETZ: We have time for a couple of questions which can be directed to any of this morning's speakers.

JIM WELLS: I've always been rather dubious about using herbicides in a plastic house and I wonder what comments some of these speakers have along this line.

PHIL CARPENTER: I think Lasso is an excellent material for use in the field but if you use it inside a plastic house you're just asking for trouble. Two of our people in Indiana used it and they both had real problems.

HUGH STEAVENSON: We goofed and used Lasso in a house and I can guarantee that if you do it you will have trouble. You should not only not use an herbicide in a greenhouse but you should not even use it near a greenhouse where it could be sucked in by the fans.

FRANCIS GOUIN: We have had some drastic losses in Maryland from the use of Casoron in greenhouses. If you do get into trouble one thing which has alleviated some of the problem has been the use of activated charcoal at the rate of 1/2 pound per 100 sq ft and keep the area fairly moist.

MODERATOR FRETZ: This concludes this morning's session.